Medical Systems, Medical Science and Empiricism:

AN

INTRODUCTORY LECTURE,

BEFORE THE

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LECTURE.

GENTLEMEN:

I do not know how I can occupy an hour more profitably for you who are commencing the study of medicine, than in pointing out the direction which medical investigations are taking at the present day, and in explaining the method which presides over them.

In ancient times, and even up to a very recent period, medicine has been, for the most part, under the dominion of general theories or systems, which professed to explain all the phenomena presented by man in a state of health and disease, by means of a few general principles, which were assumed as the basis of the system. You have all, without doubt, read of the humoral pathology, of the systems of Boerhaave, of Brown, of Cullen, and of Broussais, and besides these, I might enumerate a host of others, through which medicine has passed. I do not propose now, to give any exposition of these systems, but only to explain their nature, and

to show how they differ from medicine founded on positive science. It is important that this difference should be well understood, because all these systems are liable to serious objections, which have brought them into merited disrepute, and in the minds of many, this same disrepute has been unjustly extended to scientific medicine. I wish therefore to show, how medicine founded on systems, differs from medicine founded on positive science, and that the objections which have been urged against the former, do not apply to the latter.

In order that you may understand well what is meant by medical systems, as opposed to medical science, it will be necessary for me to make a few observations on the origin and progress of other sciences, and on the different forms through which they have passed.

It is a remarkable fact, that the human mind, in attempting to comprehend the great problem of the universe, has always commenced with the most difficult questions; with questions which, if not entirely beyond the reach of our faculties, must, at least, be reserved for the most advanced periods of science. Thus we find the earliest philosophers occupied with the nature of matter, with the constitution of its atoms,

with the number and nature of the elements, and a host of similar inquiries, which, those who are now engaged in the cultivation of the physical sciences, pass by as idle, or as beyond the reach of their means of investigation. It was only after a series of vain attempts to grasp at once the whole problem of nature, that the human mind learned to estimate its own powers, and discovered the method by which this problem could be attacked with success. Modern science is occupied only with phenomena and their relations; ancient philosophy neglected these phenomena or appearances, and sought for that which was beneath them and real. We study the changes which matter undergoes; the ancients sought to discover what matter is, and what is its essence. We study the relations of phenomena, to arrive at the laws regulating their order of succession, and strive to make these laws more and more general; the ancients endeavored to seize at once on some initial principle, by which all the changes and appearances of the world might be explained. Our science is susceptible of practical application, and contributes to the well being and improvement of the human condition; ancient philosophy had

no practical utility, and served only to gratify a taste for speculation.

If, for example, we turn to ancient systems of philosophy, to see what account they give of the constitution of the world, and of its mode of origin, we find them first seeking for some element as the beginning or principle of all things, and when they have fixed on some such principle, such as fire, or air, or water, they show how, out of this, the world was evolved. Or they seek for the ultimate atoms out of which matter is formed, and show how the world has originated from the aggregation of such atoms. The philosopher considered the phenomena presented by the things around him, as unworthy of his regard, and his system takes but little note of them. These systems, consequently, do not deal in facts, but in hollow speculations, so vaguely expressed, that men might dispute about them forever, without coming to any conclusion.

You will be more struck with the character of these systems of cosmogony, if you compare them with the parallel science of geology, as it is now received and cultivated. Modern geology gives us the results of a patient examination of the substances, out of which the crust of the

earth is formed, of its different layers, of the remains of animals and vegetables found in them, of their order of superposition, and from this anatomy of the earth, conclusions are drawn, as to its primitive condition and mode of origin. This is a positive science of facts and their relations, and differs widely from the philosophical systems of the ancients, founded on speculations more or less ingenious, but unsupported by facts.

These remarks concerning the different phases, through which physical science in general has passed, before finding its true end and method, are especially applicable to the science of man. The human organism, with its complicated structure and its varied phenomena, is a unit; it is animated by a single force which makes all its actions combine harmoniously to produce one general result. Hence the first point which suggested itself to early inquirers, was to determine the nature of this force; for this being known all the resulting phenomena would admit of an easy explanation. Properly understood, this is a legitimate problem, but ancient philosophy apprehended it very differently from modern science, and sought for its solution by a very different method. Modern science occupies

itself only with the manifestations of life, studies all the phenomena presented by the living body, seeks for their relations, which it expresses by laws, and tends by degrees to make these laws more and more general, until it may attain to the ultimate law of the whole organism. By this method, we begin at the circumference, and feel our way along the radii to the centre. It is a long and laborious process, which has exhausted the powers of many generations, and will require the labors of many more, before the work is accomplished. Ancient philosophy occupied itself with discussions about the nature and essence of life, about the vital principle in itself, and not in its manifestations, and sought to divine at once, by an effort of genius, the primordial law by which all the phenomena of the organism were to be explained. In this method, the philosopher places himself at once at the centre, and seeks for the circumference. It leads to no true knowledge, nor to any useful practical result.

Similar methods have been applied to the study of disease. Modern science studies the phenomena of disease, as presented in disorders of function, and in alterations of structure, seeks for the relations of these phenomena, and com-

pares them with what occurs in a state of health. The ancients more ambitiously sought for a general theory of disease, and inquired into its essence, rather than its manifestations. In this way, have been formed the medical systems, which, mixed up with more or less of positive science, have continued to prevail, long after other departments of science had adopted the true methods of investigation. What I have said of the general character of ancient philosophy, applies to these systems: their authors neither apprehended the true end of science, nor did they possess the true method for its cultivation.

It would be tedious and unprofitable for me to attempt to give an exposition of these systems; some attributed diseases to the pneuma; others, adopting the general ideas of Epicurus, maintained that man results from an accidental reunion of atoms which affect a determinate form, and that the regular or irregular movement of these atoms in the vacuum assigned to them, gives rise to health or to disease. As we come down to modern times, the language of the systems becomes more intelligible, and they express great truths more clearly, but they are all tainted with the same defects. The system of Brown, which has prevailed almost in our

day, is founded on a great truth; "Life is maintained by stimuli." But in developing this truth, the author arrived at a general classification of all diseases into sthenic and asthenic, and the treatment was reduced to the greatest simplicity, for one had merely to determine to which of these classes, any particular disease belonged, and to employ the remedy calculated to overcome the condition present. There is here no reference to particular organs, nor to alterations of structure which may have occurred in them; there is no attempt to explain the mechanism of disease, nor to trace it to organic derangements; indeed the whole matter is so vague and speculative, that one might practise under this system, without knowing any thing about the structure of the body or its functional actions.

Though the general character of all medical systems was such as I have described, you must not suppose that they were made up exclusively of speculations, and contained no facts. These speculations expressed a certain view of facts, but the view was one-sided and exclusive, and hence, while the system incorporated a portion of facts known at the time, these were imperfectly stated and perverted, so as to be made to meet the requirements of the system. In many sys-

tems, for example, diseases were attributed to alterations of the fluids, and so far undoubtedly they expressed a truth, but these alterations as described, were for the most part imaginary, such as viscidity or tenuity, or alkalinity or acidity, and medicines were directed to be employed from their imagined aptitude to overcome these imaginary alterations.

Systems, like these, having the double defect of being exclusive, and of being hollow speculations, have by turns reigned in the medical world. At a time, when the facts of the science are few and imperfectly observed, a man of genius seizes in some particular face of the truth, and on this he proceeds to found his system. Being exclusive, the system necessarily refuses to admit many facts within its frame work, and these, the author refuses to see, or boldly denies. The system, adopted with enthusiasm by ardent disciples, continues to flourish, until the exceptional facts become so numerous and so obvious, that they serve as the foundation of a new system, which springs up to be destroyed in its turn, in consequence of the same defects. Thus medicine has oscillated from vitalism to humoralism, and then to solidism, then to recommence a similar course, so

that from its history it would seem to have been always turning in the same circle without improvement. This is, however, not altogether true, for although, from the wrong direction in which medical investigations have been pushed, the results obtained have not been in proportion to the labor bestowed on them, yet, in the midst of these oscillations, medicine has been advancing as a science, and gradually approaching to a true method.

While the great mass of philosophers was occupied with unprofitable speculations and premature attempts to solve the great problems of science, by the force of genius, rather than by patient observation, there always were others who pursued the less pretending, but more useful course of observing nature, as presented to the senses. Among the results of the labors of this latter class, we may rank the admirable observations of Hippocrates on the course of disease, the contributions of Aristotle to natural science, the discoveries in anatomy, &c. In other words, a positive science, founded on observation and experiment, was growing up by the side of the philosophical systems, and these systems, as they succeeded each other, incorporated more and more of the facts accumulated

by the labors of the true observers of nature. Indeed, these systems have served as important auxiliaries to the advancement of positive science, because they served to bind together scattered facts, and because new facts were elicited by the attempts to support or refute the conclusions of the systems. In this way, the systems, which in the beginning were hollow speculations void of facts, in the progress of time approached more closely to the character of positive science, until this latter character became predominant.

The last system which prevailed in the medical world, and the last which will prevail, was that of Broussais, which, some fifteen or twenty years ago, created such a sensation, and was adopted with such enthusiasm by the rising generation of that day. Promulgated at a time when positive science had penetrated into every department of nature, it partook largely of this character, and was only defective, as a premature attempt at generalization, without a sufficient number of facts to serve as a basis. The great fault of the author lay in the attempt to frame a system, which should embrace the whole science of man, in a state of health and disease, while the science was yet in its infancy; it was

the effort of a man of genius to accomplish an impossible task; it was as though an astronomer living before Kepler, should have attempted to frame an astronomical system like that of Newton. Hence, while as a system it has fallen, the facts and generalizations attained under its influence, still remain. It has been succeeded by no other system, but by positive science, which has now taken the place of all systems.

If you would now see medical systems, you must look for them, not in the medical world, but in the world of imposture and dupery; such is homœopathy with its noted dictum, Similia similibus curantur; or Thomsonianism, which cures diseases on the principle that "heat is life, and cold is death." To such base uses are the cast off garments of medicine now turned.

Systems and vague speculations have now passed away from medicine, and have been succeeded by positive science, founded on observation and experiment. In place of an art founded on systems, we now have an art founded on the science of man in a state of health and disease; that is, founded on physiology and pathology. We no longer inquire into the essence of life, nor into the nature of the vital principle; nor do we look for an initial principle by

which to explain the phenomena of health and disease, but we study these phenomena, analyze them, seek for their relations and express these relations by general laws. In any given case of disease, we trace the phenomena present to the organic derangements on which they depend, and then explain as far as we can, their mode of generation and order of succession. In many cases, the explanation is defective, for medicine is as yet too imperfect to have attained to the high degree of generalization to which some of the other sciences, as astronomy, have arrived. In these cases, we can at least measure the extent of our knowledge, and not deceive ourselves by vague discourse and speculation, "darkening counsel by words without meaning."

Positive science is founded on facts; it studies only phenomena and their relations. It does not seek to go behind the phenomena, to speculate about the essence of matter or of mind, or the nature of causation; it deals only with materials furnished by the senses or by consciousness. It does not seek to explain why phenomena succeed each in this or that order; but only inquires what that order is; it merely assumes that their order of succession is invariable, and seeks for the laws expressing it. It

demands reasoning and research, for these relations are not obvious to the senses, but must be sought out with great labor; but it requires also that all its results should be susceptible of verification by the senses.

When we have discovered the relations of phenomena, or their order of succession, we are enabled to predict results; and when we can predict results, we can arrange circumstances to procure a desired result. This knowledge is science; this application is art. Herein lies the whole secret of man's knowledge of nature, and of his dominion over nature.

It has taken the human race many ages of fruitless efforts in a false direction, to learn at last, that man can know nothing of nature, but phenomena and their laws, and that his dominion over nature can only be attained by obedience to these laws. Since these great truths, so simple and so fertile, have been known and acted on, physical science has made an immense and constantly increasing progress, and the arts have advanced in a proportionate degree, and are daily astonishing us by new and brilliant results. Now, what science was, when it existed under the name of astrology and alchemy, so was medicine as a system, to medicine as a

positive science; and the art of medicine now firmly established on this foundation, has already entered in a career of improvement which holds out the prospect of results as brilliant and useful as those presented by the other arts. It is true, that the results as yet attained in practical medicine, are less striking than those presented by the other arts, for medicine has been the last to feel the impulse derived from the true method of investigating nature. The language and the false method of systems even now continue to infest our science, though they are rapidly disappearing. A glance at the progress of medicine since a more sound method has presided over its cultivation, justifies the most sanguine hopes for the future. If we look back, we find that it is a little over two hundred years, since the circulation of the blood was explained by Harvey, and one can scarcely conceive of a science of physiology, while this movement, intimately concerned in every vital act, was unknown. Anatomy had, before that, pointed out the general structure of the organs, but their uses were, for the most part, unexplained. Since that time, physiology has felt the impulse communicated to the other sciences, and is now making so rapid progress, that the

text books, in which the advances of the science are posted up, must be written over every few years. Corresponding progress has been made in anatomy, especially in microscopic anatomy, which is opening a new field of research, and is changing the whole face of physiology; and within a few years, Liebig has pointed out new applications of organic chemistry to the explanation of the phenomena of life, which may be ranked among the most brilliant achievements of modern science.

Nor has this progress been confined to the science of man in a state of health. Within the last twenty years, the phenomena of disease have been studied with a care and method which were before unthought of. Pathological anatomy has been cultivated with great zeal and success, and here also the microscope, which promises to be for our science, what the telescope is for astronomy, has revealed a host of organic changes, which were before unknown. The chemical relations of the fluids in disease, are becoming intelligible, and the alterations as at present demonstrated, present a singular contrast with the qualities vaguely attributed to them, by the old humoral pathologists.

Improvements in the art of medicine must

follow such progress in the science. Indeed is it not obvious, that in order to cure diseases, it is necessary first of all to understand the structure and actions of the body in which they occur? Vague discussions about the essence of disease, or the vital principle, can be of no use to us in devising a remedy for any given diseased condition, just as men could never construct a steam engine, nor attain any useful mechanical result, by investigating the essence of matter, or the constitution of its atoms.

In every disease, we have a certain alteration in the fluids, or solids, or both of the body, whether it is appreciable by our senses and present means of investigation, or not; and this alteration interferes mechanically, or chemically, or vitally, with the due performance of function. If we can point out this alteration, and show, how, in accordance with the known laws of the organism, it produces the functional derangements which are present, then we may be said to understand the disease, and we may judge of its curability and devise the proper remedies. When we cannot thus trace the diseased actions to their source, we must practise with a prudent empiricism, as I shall explain presently.

In a case of disease, we have, first of all, to

study the various functional derangements or symptoms by which it is manifested to us; then to interpret these symptoms, and refer them to the organic alteration on which they depend, and lastly to devise the means of removing this lesion, or of palliating it, if it can not be removed. Such is the problem presented to us in every case of disease, and you can readily see, what an amount of scientific knowledge it demands.

To render more obvious, the difference between medicine founded on positive science, and medicine founded on systems or vague generalities, I will illustrate it by an example. For this purpose, I will take some well marked disease, and see how it will be explained.

According to Brown, dropsy is a disease of asthenia, and this is all that it is important for us to know. The treatment is as simple as the pathology: the asthenic condition is overcome by stimulants; therefore stimulants will cure dropsy.

According to others, who adopt a vague and general kind of reasoning, but more nearly allied to positive science than the last, dropsy is caused by a want of balance between the action of the exhalent vessels and the absorbents, and hence

we must use remedies which will diminish the exhalation and increase absorption. Without stopping to criticise this pathology, further than to say, that it merely states the fact that an effusion exists, in different words, let me pass at once to the view which positive science will take of the disease.

It has been demonstrated by observation and experiment, that dropsy may be produced by different organic lesions. Thus, it may be caused by a venous congestion long maintained, and a venous congestion may be kept up locally by an obstruction of a large vein, or by disease of the liver, or it may be general and depend on disease of the heart, impeding the circulation of the blood. Again, dropsy may depend on a disease of the kidney, manifested by a peculiar alteration in the urine, and in which, the urea is not separated from the blood. And it may depend on other causes. When a particular case is brought before us for investigation, we must then determine, to which of these lesions it is to be referred, before we can judge of its curability, or of the proper remedies. Suppose, for example, that with the dropsy, we find physical signs indicating a disease of the heart, and that the course of the effusion has corresponded with

what would be produced by a mechanical impediment to the circulation, depending on such a cause. We can then trace all the symptoms to this starting point, and can explain their mode of production. We can also judge of the possibility of curing the disease, and the best mode of arriving at the cure, if possible, or of palliating when we can not cure.

To the follower of the system, all dropsy is alike; it is an asthenic disease, and it is to be cured by remedies supposed to overcome this condition. No matter whether it depends on disease of the heart, or of the liver, or of the kidneys, or of the blood; the follower of the system applies the same remedy indiscriminately to all these different lesions, of which his system does not lead him even to suspect the existence. All that he cares to know about the disease is, that it is asthenic!

Such is the difference between the clear and definite explanation of a disease, which consists in referring it to some organic lesion, and the vague and unsatisfactory accounts given by the systems which attempt to bring every thing within their principles, apparently so simple, but in reality so unmeaning. Many systems, as has been already remarked, contain a portion of

positive science, and so far may be of some use in practice; but as systems they are worthless, and even worse, for they give an air of knowledge to ignorance.

I have occupied some time in explaining the nature of medical systems, and in pointing out their defects, not because there is any danger that you will, at this day, be tempted to embrace them, but rather to make you see clearly the difference between them and scientific medicine, and thus prevent you from adopting a popular prejudice against the latter, which applies only to the former. Scientific medicine, like medical systems, requires reasoning, but the one reasons on facts, and the other on speculations; and as the false reasoning of systems leads to absurdities and mischief in practice, some men have fallen into a distrust of all reasoning, and have attempted to find a practice on experience alone, or on empiricism. Now, that you understand the difference between scientific medicine and medical systems, I will show you the difference, as well as the resemblance between scientific medicine and empiricism. Let me first show how empiricism has its origin, and wherein it finds its justification.

When men have once adopted a system, and

still more, when they have invented one, they are exceedingly averse to admit any opposing facts or reasoning; they try to make facts bend to the system, rather than to make the sytem bend to facts. This remark does not apply to medicine alone, for we find the same perversity manifested in theology, in morals and in politics. A system or a theory is always founded on some truths, and leads to some true conclusions, but also contains errors, which, though they may not strike us, when existing only in germ, in the principles of the system, become more and more apparent, as it is developed and carried out to its logical conclusions. Now it so happens that when an imperfect system or theory leads to some absurd conclusions, the partisan is very apt to adopt these conclusions, however repugnant they may be to common sense, rather than abandon his system. Numerous examples of this disposition to reject all facts adverse to an adopted theory, might be adduced in medicine. We find, for example, that in low fevers, the patient sometimes falls into a state of prostration, which can only be relieved by stimulants freely administered, but a disciple of Broussais would refuse to admit the truth of such facts, because his system main-

tains, that this prostration depends on an inflammation of the nervous cenres, and that for this reason, it is impossible that stimulants should be otherwise than injurious. On the other hand the disciple of Brown could not be made to see that stimulants were ever injurious in fever, because his system maintains that they are asthenic diseases, and consequently require stimulants. To such absurdities does a partiality for preconceived views carry the human mind, that a medical philosopher once said, "I had rather be in error with Galen, than right with any body else."

There are, however, some men to whom, systems or theories present no attractions; men of good common sense, without much capacity for reasoning, men who care little for logic, and a great deal for the evidence of their eyes and ears; practical men as they are called. These men, struck with the absurdities to which systems, when pushed to their consequences, give rise, are led to reject all reasoning, and to rely only on experience. These men are empirics, and this mode of practice is empiricism. (I use these terms not, in the bad sense ordinarily attached to them.)

Empiricism is the protest of common sense

against the absurdities to which a blind adherence to the conclusions of theories gives rise; but a pure empiricism is perhaps the most dangerous of all systems. It professes to be founded on experience, but it is the experientia fallax of which Hippocrates speaks. Scientific medicine also professes to be founded on experience, and so far would seem to accord with empiricism, but the experience, in the two cases, is of a very different nature. Let us see now what is the exact difference between scientific practice and empiricism. I will begin by an example.

The empiric has observed, that in a certain number of cases, a given diuretic or purgative has removed a dropsical effusion; he has noted this fact as the result of his experience, and when another similar case presents itself, he administers the same remedy. This is empiricism; it is the mode of reasoning and practice of the vulgar, who say to you, such a remedy has been found good for such a disease, and therefore recommend it in all such diseases for the future.

Now let us observe a learned physician called to this case of dropsy. He too is going to appeal to experience, in support of what he does, but it will be experience of a very different kind.

He knows that dropsy may depend on different lesions, such as of the heart, veins, liver, kidneys, &c., and knows the diagnostic signs by which these lesions may be detected during life. Mark, he has learned this too by experience, for how does he know that dropsy may be caused by disease of the heart, except by having found such disease in persons who have died of dropsy, and by experiments and observations on living animals, that obstruction of the circulation is capable of causing dropsy; and as regards the diagnostic signs, he has found by experience, that certain physical signs observed during life, correspond with certain lesions after death. You see then, the one appeals to experience as well as the other. The empiric calls this experience of science, theory; but whatever it may be called, it is founded on the evidence of the senses.

But let us now see which of the two will have the advantage in practice. The empiric has found that a certain remedy has cured certain cases of dropsy, though it has sometimes failed. Why does it ever fail? By his method, he can find no answer to this question; he must be guided by what on the whole seems indicated by his experience. The scientific physician has

analyzed this complex fact, dropsy; he has taken it apart, and has found that it may depend on several very different organic lesions, so that what, to the eye of the empiric, appeared always as one disease, in reality is a symptom of several very different diseases. The same remedy can not be adapted to all these lesions, and hence he explains the occasional failure of the empiric's cure. If it is proper for dropsy caused by cardiac disease, it may be very inappropriate for that caused by disease of the kidney. He seeks not then for a remedy capable of removing this general condition dropsy, but for the remedies capable of removing each of the organic lesions into which he has decomposed it. You easily see whose practice will be the most certain.

A host of similar illustrations may be adduced. The empiric says this mixture cured my cough, therefore it will cure your cough. This is an appeal to experience, but it is a fallacious experience. Wherein lies the fallacy? Simply in this; that the two cases may not be similar. Cough may depend on a number of organic lesions, and the same remedy is not adapted to all these lesions; for example, an opiate may be the proper remedy for a cough depending on

nervous irritation, but not at all for one depending on inflammation. Empirical experience will then fail us in practice, unless the two cases are in all respects alike.

These instances may serve to give you an idea of the difference between practice founded on empirical experience, and practice founded on science, but as you may not yet see clearly the difference between empirical experience and science, I will present the matter in another form, and with as much clearness and precision as I can.

When we adapt means to produce an end, we must first know that the means will produce the end, that is, all our contrivances are founded on a knowledge of the course of nature. This knowledge is science, the application of this knowledge, is art.

Knowledge of nature exists in two forms, which differ in degree, but not in kind, but which, for our present purpose, must be distinguished. Every body knows something of the course of nature, such as that day succeeds to night, that the seasons follow each other in a certain order, that heavy bodies fall to the earth, that plants and animals grow. This is the knowledge possessed by the great mass of men,

and it is on this knowledge that they act. How does this knowledge differ from science? It would require much time to examine this question in all its bearings, but for the present purpose, it may suffice to show how popular knowledge expresses only the relations between complex phenomena, while science seeks to express the relations between simple phenomena. Phenomena, as presented in nature are complex, and are made up of elementary phenomena, and while popular knowledge goes no farther than to seek for the relations between these complex phenomena, science analyzes them, reduces them to their elements, and finds the relations between these elementary phenomena. The laws of nature are nothing more than the expression of the relations between simple phenomena. Hence while it is true, that science is made up of facts and their relations, it is also true, that in order to attain to science, it is not enough to use our eyes and hands. The facts are visible and tangible, but the relations are not obvious to the senses. To find these we must take the facts apart, and see what is contained in them. That the candle before me is giving out light and heat, is obvious to any one whose senses are perfect; but by science, we know also that

there is here going on a combination of oxygen and hydrogen generating water, and of oxygen and carbon generating carbonic acid, and other elementary acts accompanying the combustion. Any one can see water rising in a pump some thirty-six feet, but science makes us also to see in this, the atmosphere pressing on the surface of the water, the reaction of the particles of the water on each other, causing the column to rise until it equals in weight a column of atmosphere, and hence too, shows why water will not rise so high in a pump on a mountain, as at the level of the sea.

The relations of phenomena are invariable; they always succeed each other in the same order, and hence when we have found the relations between simple phenomena, we have a law with no exceptions; but a change in any of the conditions of a complex phenomenon, changes the result, and hence by the study of complex phenomena, we do not arrive at universal laws. Popular knowledge says that heavy bodies fall to the earth; but to this there are exceptions; it is not a universal law, for a balloon rises in the air; the simple fact that masses of matter have a tendency to approach each other, is universally true, and embraces the

complex phenomenon of the fall of a stone and of the rising of a balloon. For this reason, science, whenever it has attained to a complete analysis of phenomena, lays down laws which are universal and certain; common experience, which sees phenomena in the gross, can only attain to probability.

While popular knowledge or common experience and science are both founded on facts observed by the senses, they often differ in their conclusions, and sometimes their conclusions are precisely the reverse. Science says there are antipodes; experience says that every thing must fall off the lower half of the earth; science says the earth is spherical and moves with immense velocity; experience says it is an extended plain and motionless; science says, the earth goes round the sun; experience says, the sun goes round the earth. Remark, that while each arrives at an opposite conclusion, they both appeal to the senses in support of their conclusions. The one has seen, the other has looked and reasoned.

Popular knowledge is sufficient for the great mass of men. Thousands light their candles every evening, without having ever suspected that the presence of oxygen gas is necessary

for the success of the operation, and pump up water without ever having thought of atmospheric pressure. The arts, however, require the kind of knowledge we call, science. Popular knowledge would never suffice for making a match to ignite by friction, nor for constructing a steam engine.

Such are the two forms of knowledge, which as you see, differ greatly in degree, but not in kind, for popular experience has attempted a rude analysis of phenomena, and science has, only in rare instances, attained to a perfect analysis. Practically, however, the difference is sufficiently obvious. Now empiricism is art founded on the observation of the relations of complex phenomena; scientific art is founded on the observation of the relations of phenomena as analyzed by science.

We are now prepared to understand what is meant by certain and uncertain sciences. The certainty or uncertainty of a science, depends not on the relations of the phenomena, for these are always invariable, but on the degree to which we have succeeded in analyzing them. There are some departments of nature, in which the analysis of phenomena has been pushed so far as to furnish us with simple phenomena, which

give us what are called, ultimate laws. Of this character, is the law of gravitation, which expresses a simple relation, and to which no exception exists. When we have arrived at such laws, we can predict with absolute certainty, whatever depends on their operation, as is remarkably exemplified in the science of astronomy, which gives us the means of determining, from the present condition of the heavenly bodies, their position at any past or any future time. The sciences, in which we have arrived at ultimate laws, are called certain sciences.

In other sciences, the analysis of phenomena has been less complete, and here we have laws of more generality than those derived from popular experience, but not ultimate laws, and consequently the power of prediction does not, in such cases, rise higher than probability. Such sciences are then uncertain. We know, for example, that opium will in general procure sleep, and that aloes will purge, and the conditions which must be present, in order that these medicines should produce such results, but, in no given case, can we predict with absolute certainty, that a grain of opium will, or will not, produce sleep. The reason is, that we have not analyzed the phenomena presented by the living

body, so as to arrive at their ultimate laws; we have not determined the elementary action of opium on the nervous fibre, but only the complex fact, that, in most cases, it causes sleep, and as a variation in any of the unknown elements which go to make up this complex fact, will cause a variation in the result, our power of prediction cannot rise higher than probability.

Suppose one only knew of a steam boat, that a fire in the furnace would make the paddles revolve; this would be an empirical law, derived from the experience of a complex fact, and would hold good in most cases, but would sometimes fail. It would fail whenever there was no water in the boiler, or when the steam did not act on the piston, or when the machinery was broken. The elementary movements, such as the expansion of the steam when heated, or its condensation when cooled, never fail. The engineer, knowing all the elementary acts which concur to produce the general result, would know in all cases, why the fire in the furnace failed to make the paddles revolve, and when it was going to fail, the man whom we have supposed ignorant of these elementary acts would only know that

the law founded on his experience, sometimes holds good and sometimes fails.

Now our knowledge of the action of opium on the body, is analogous to that of the person who only knows of the steam boat, that the paddles usually revolve, when there is a fire in the furnace. Between the introduction of opium into the body and the sleep produced, there are many intermediate elementary acts, of most of which we are ignorant, and as a modification of any one of those unknown elementary acts may change the result, we are liable to disappointment, just like the person in the case we have supposed, in regard to the steam boat. The elementary action of opium is as invariable as that of heat in causing the expansion of steam; and one who should understand all these elementary acts, would predict the effects of opium in any given case, with as much certainty, as the engineer can predict in any given steam boat, whether a fire in the furnace will cause the paddles to revolve.

What I have said of the action of opium on the body, applies to medical science in general. We have, to a certain extent, analyzed the phenomena presented by the human body in a state

of health and disease, but we have not succeeded in pushing this analysis so far, as to arrive at phenomena of absolute simplicity, or at ultimate laws. Hence, while our power of prediction is vastly superior to that furnished by a coarse popular experience of complex phenomena, it is far from entire certainty. In other words, medicine is an imperfect science.

All art being founded on the power of prediction afforded by science, it will be more or less fallible, in proportion as this prediction is more or less certain. Empiricism, which is art founded on the observation of phenomena in their greatest degree of complication, is most of all liable to error. Scientific art will be infallible when founded on ultimate laws, as in some rare cases it is, and when founded on laws of less generality, will be in the same degree fallible. Since medical science is imperfect, since the laws it furnishes are not expressions of simple phenomena, medical art must be fallible. We cannot therefore require of the physician that he should always be successful, nor even that his anticipations should always be realized, for his art can not be in advance of his science.

We have now attained a point of view at which we may readily appreciate the relative

advantages of empirical and of scientific medicine. The empiric sees a certain remedy cure a certain group of symptoms, and without further examination, he notes this fact and acts upon it. In some cases, this mode of practice is successful and tolerably certain, as for example, in the treatment of intermittent fever by Peruvian bark. But this is not common; diseases are indeed classified and described in books as though they were well defined existences, but they do not so present themselves at the bed-side. They here appear as disordered actions of different organs, which are grouped together to form innumerable combinations. Of the cases met with in practice, not one in twenty corresponds in all respects, with the descriptions found in books, and hence the physician is compelled to rely on general principles, which he must apply to the individual case before him, and not on mere empirical rules. The physician at the bed side, is like the general of an army in face of the enemy. There are principles of attack and defence, with which the general must be acquainted, but there can be no special rules which he can follow blindly, for the reason, that in each battle, there are peculiarities of position, of numbers, of formation of

the ground, which cannot be provided for in advance, and which demand the application of his science to the individual case. It would appear supremely absurd, for a general to seek for some rule by which he could gain battles, and for the physician to look for rules for curing diseases, without appealing to the general principles of his science, presents an absurdity less obvious perhaps, but not less real.

In scientific medicine, we do not consider it, sufficient to have observed that a given remedy has cured a given disease, for the circumstances are so numerous, that we cannot judge of the effect of the remedy, nor how far the cure depended on it. We endeavor therefore to trace the symptoms to the organic lesions which produce them, and to show the effects of such organic lesions according to the known laws of the or-organism. To recur to a former illustration; we trace a dropsical effusion to a disease of the heart, and show how such a disease would cause cause the effusion. We address our remedy then to the lesion which causes the symptom, and not to the symptom which may depend on very different lesions. In a word, we endeavor to decompose the disease into its elements, rather than to cure it in the gross.

I repeat, however, that in no case have we arrived at any thing like an ultimate law in medicine. The fundamental vital action, nutrition, is not a simple act, but very complex, and we have not succeeded in analyzing it, so as to show all its elements. In like manner; the commonest form of disease, inflammation, is defined by its symptoms, but the precise nature of the deviation from health has not been pointed out, and indeed never can be, until we have a complete knowledge of the nutritive act. From this imperfection of medical science, it follows that all the practice founded on it, is more or less uncertain. In some instances, our practice is purely empirical, as when we give bark in intermittent fever. In other cases, we analyze the phenomena to a certain extent, as when we find dropsy depend on a granular degeneration of the kidneys, but here we cannot point out precisely what this alteration is, nor why it hinders the separation of the urea from the blood, nor can we even tell why the kidneys in health separate urea from the blood. So that the difference between empirical and scientific medicine reduces itself to this, that the former attempts no analysis of the phenomena of disease, while the latter plunges as deep as possible into this analysis,

but without in the present state of the science, reaching any ultimate law, and consequently without attaining to absolute certainty in practice.

It is plain then, that there can be no question as to the superiority of scientific practice over empiricism, any more than there can be of science over popular knowledge. That which has given countenance to empiricism as a method, is the tendency already alluded to, of adhering to a theory or system even when the absurd results to which it logically leads are manifest. This is, however, not an objection to scientific practice, but only to a blind adherence to the conclusions of a false science. When our science leads to mischievous practice, it should be at once abandoned as false, for the best test of the soundness of our principles, is to be found in the conclusions which may be logically deduced from them.

Undoubtedly empiricism has its uses, and has introduced many important improvements into our art. The properties of all the medicines we possess, have been discovered empirically, and even at this day, we could not suspect from any of the chemical or mechanical properties of jalap or of ipecacuanha, that the one would purge and

the other vomit. Many of the most valuable remedies have been discovered in the same way, as for example, Peruvian bark in intermittent fever, and mercury in syphilis.

The two modes of practice, though not separated by a well defined line, differ widely in their method and in their tendencies. The empiric seeks for remedies for diseases, the scientific practitioner seeks to understand the disease, to trace it to its starting point, and to explain it by the known laws of the organism. The practice of the latter must be to a certain extent, empirical and uncertain, because he has no ultimate laws on which to found it, and in some cases must be purely empirical, inasmuch as he can not give any explanation of the disease or of the mode of action of the remedy which he has found to cure it. The empiric discards all science as the foundation of practice, while the scientific practitioner employs the science which, imperfect as it is, is all that has thus far been attained by the human mind, without refusing to profit by empirical experience when science fails him.

But while we allow to empiricism its full place in practical medicine, and admit that scientific practice in its present condition, is only an enlightened empiricism, we look to science for the

future improvements in our art. Medical science is now so far advanced as to have become more and more adapted to practical uses, and in many directions, our analysis of the phenomena of life has been pushed so far, as to give the promise of arriving at ultimate laws. But without resting on any such problematical anticipations, if we look backwards to see what has been done within the last fifty years, we will find that the improvements of our art have depended, not on the discovery of new remedies, but on the progress of our science. The modern improvements in diagnosis, which have rendered medical practice so much more certain and safe, have all been results of scientific observations. If we can treat diseases of the lungs and of the heart with more success now than formerly, the reason is, not that we have new remedies, but that we understand better than before the lesions of these organs, and have improved means of detecting them. In almost every medical journal, we find some new remedy for consumption, which is greedily procured by the seekers of cures, and with what result? why not one of these remedies continues in favor for more than a few years, while the researches of Laennec into the morbid anatomy of the disease and his

new means of diagnosis remain, and will forever remain, as our guides to practice. And I will now predict with great confidence, that if ever a remedy is to be found for this disease, it will result from an investigation of the nature of tubercular deposit, and the conditions which give rise to it, and not from a blind search after cures. The truth is, we have remedies enough if we only knew how to use them. When I see a man ignorant of medical science greedily demanding new medicines and new combinations, it seems to me as though a sign painter should think he could make a fine picture, if he could only procure the colors and brushes of some great artist.

We hear a great deal, in our profession, about practical knowledge and practical men. All knowledge, whether it be of an eclipse of Jupiter's satellites, or of the germination of a grain of wheat, is susceptible of practical application, and so far is practical; and other things being the same, he will be the best fitted for practice who has the most knowledge. There is, undoubtedly, a certain tact, a certain faculty of invention which some men do not possess, and without which, one cannot become a great practitioner, though he may be well versed in science, but

be assured that the fault here lies in his want of this tact, and not in his possession of learning. If he knew less, he would be still less capable of practice. Look into the lives of all the great masters of our art, and you will find them profoundly acquainted with the science of their day, and the principles of the art, and not practical men in the sense of being ignorant. I have never known theoretical knowledge decried, except by those who did not possess it.

If, then, you would become truly eminent in your profession, study well the theoretical branches. Learn the science of medicine before you attempt to learn, and still less to practise the art. Undoubtedly the great physician must be formed at the bed side, and not in the study, but you will profit by your bed side experience, precisely in proportion as you came armed with science, which will enable you to comprehend what you see. The nurse sees disease all her life, and learns nothing but to be self-sufficient; so there are practitioners of medicine who boast of the experience of a long life, and yet have never learned any thing, for the reason that they did not possess enough of science, to furnish them a key to the comprehension of what was passing under their eyes. It is with them as it

would be with a man who should look at books all his life, without having learned to read. Make it a point then during your studies here, to understand diseases rather than to learn prescriptions and remedies. This is the time for you to learn the science of medicine, the practice you will be learning all the rest of your lives, and you will profit by the latter precisely in proportion, as you are well grounded in the former.